

Parabolic Flight Evaluation of a Hermetic Surgery System for Reduced Gravity

Problem Statement

- Technology Problem: Currently no apparatus exists to perform surgery in space. There are no methods for isolating the surgical cavity nor managing bleeding.
- Importance: Critical technology to handle trauma/emergencies during long duration space missions
- Flight opportunity allows us to test early prototypes of a surgical system that will isolate the wound to prevent cabin contamination, facilitate hemostasis, and aid in surgical field visualization.
- Potential users: Astronaut physicians

Technology Development Team

- George M. Pantalos, Ph.D.; Professor of Surgery and Bioengineering at University of Louisville; gmpant02@louisville.edu
- James F. Antaki, Ph.D.; Professor of Biomedical Engineering at Carnegie Mellon University; Antaki@andrew.cmu.edu
- To be determined.

Proposed Flight Experiment

Experiment Readiness:

- September 2012

Test Vehicles:

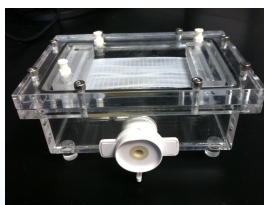
- Parabolic aircraft

Test Environment:

- Previous flight environment: None
- Requested environment through FOP: zero gravity, lunar-g, Martian-g

Test Apparatus Description:

The developmental models of the HeSS to be evaluated are affixed to the top of the instrumentation chassis with the operators positioned on each side foot-strapped to the floor of the aircraft. On the top of the instrumentation chassis is a sealed chamber with multiple ports to evaluate chamber pressurization of surgical structures and surgical instrument insertion that have been part of the HeSS development pathway.



Technology Maturation

- Current TRL: 4
- TRL 5: Fall 2012 flight campaign will evaluate prototype in relevant flight environment.
- TRL 6: Fall 2012 flight campaign will provide early subsystem evaluation in relevant environment in anticipation of system integration
- Fall 2012: Initial evaluation of subsystem prototype in relevant flight environment; Winter/Spring 2013: Development of near final version of technology; Summer/Fall 2013: Parabolic flight campaign evaluation of near final version to achieve TRL 6; Winter/Spring 2014: Development of final prototype; Summer/Fall 2014: Final parabolic evaluation to achieve TRL 7
- TRL 6 deadline: Fall 2013

Objective of Proposed Experiment

- Objective 1: Observe prototype hydrodynamics in relevant environment
- Objective 2: Given the hydrodynamics may be different in microgravity, determine optimal placement of suction instrument to remove blood from surgical field
- Objective 3: Demonstrate feasibility of surgically repairing tissue in an aqueous environment in reduced gravity conditions